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TITLE: The Effect of Latent Heat Release on Synoptic-to Planetary Scale Wave Interactions: Observational Study

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SIGNIFICANT ACCOMPLISHMENTS IN THE PAST YEAR:

We are completing an investigation of a blocking pattern which formed over eastern North America following the landfall of Hurricane Juan during November 1985. We hypothesize that latent heat released in the Hurricane's rainfall was either directly or indirectly responsible for the large observed 500 mb height rises over eastern Canada during the formation of this block. This idea is evaluated with a diagnostic model for the height tendency field which includes latent heat release as a forcing function. The total column heating is calculated using satellite-derived precipitation estimates provided by Dr. Pete Robertson of the Marshall Space Flight Center. These estimates are qualitatively congruent with observations, but overestimate light rainfall (in magnitude and aerial extent) and underestimate heavy rainfall (in magnitude). The heating is distributed sinusoidally in the vertical direction with a maximum at P=550 mb.

The calculations reveal that the direct contribution of the heating to the 500 mb height tendency field is small relative to the quasigeostrophic forcing. However, maxima in heating (i.e. rainfall) coincide with regions where anticyclonic potential vorticity is generated. Once such region is just upstream of the location of large 500 mb height rises in the incipient block. We therefore propose an indirect role of the heating in this case. Specifically, anticyclonic potential vorticity is generated near the heating maxima; this vorticity is then advected downstream, forcing the 500 mb heights to rise and the block to develop.

FOCUS OF CURRENT RESEARCH AND PLANS FOR NEXT YEAR:

Currently we are testing the sensitivity of the above findings to the shape of the vertical heating profile, recognizing that a sinusoidal shape may be too simplistic. Once this is done, a paper now in preparation which describes this work will be submitted for consideration for publication.

Now that we have tested Robertson's satellite precipitation algorithm with a continental case, we wish to investigate blocking examples over the Atlantic Ocean where there is no precipitation data against which to compare the satellite estimates. We have requested the satellite data for blocking cases during January and February 1983 and April 1982, each associated with intense surface cyclone activity. While we await this data as Dr. Robertson refines his algorithm to ameliorate the inaccuracies noted earlier, we have begun to investigate the observed adiabatic dynamics of these cases, focusing upon the effect of static stability variations. We hope to complete this work within the next year.

PUBLICATIONS:

No papers have yet to be published from the above work. The following paper is in preparation for submission to the Journal of the Atmospheric Sciences:

> "Large-scale circulation changes during the landfall of Hurricane Juan (1985): The Importance of latent heat release during the formation of a block".

The following paper based upon the above work was presented at the American Meteorological Society's Conference on Atmospheric and Oceanic Waves and Stability in August 1987:

> "The importance of diabatic heating in the formation of a block".

Finally, the following paper, co-authored with Robert B. Jacobson of the United States Geological Survey (USGS), has been submitted for consideration as a chapter in a USGS technical report:

> "Meteorology of the storm of November 3-5, 1985 in West Virginia and Virginia".